CLAIMS

1. A method of introducing a nucleic acid into cells by electroporation, comprising
the step (A) of loading a nucleic acid onto the surface of an electrode;
the step (B) of adhering cells onto the surface of the obtained nucleic acid-loaded electrode; and
the step (C) of applying electric pulses to the adhering cells.

2. A method of introducing a nucleic acid into cells by electroporation, comprising
the step (a) of providing an electrode with a cationic surface;
the step (b) of adsorbing and loading a nucleic acid onto the cationic surface of an electrode;
the step (c) of adhering cells onto the surface of the nucleic acid-loaded electrode obtained in the step (b); and
the step (d) of applying electric pulses to the cells.

3. The method according to claim 2, wherein the electrode with a cationic surface is an electrode on which the monolayer of a thiol compound, a disulfide compound or a sulfide compound having an anionic functional group at the terminal is formed and a cationic polymer is adsorbed onto the surface of the monolayer.

4. The method according to claim 2, wherein the electrode with a cationic surface is an electrode on which a monolayer of a thiol compound, a disulfide compound or a sulfide compound

or a silanising agent having a cationic functional group at the terminal is formed, an anionic polymer is adsorbed onto the surface of the monolayer and a cationic polymer is further adsorbed onto its surface.

5. The method according to claim 2, wherein the electrode with a cationic surface is a transparent electrode on which a cationic polymer is adsorbed.

6. The method according to claim 2, wherein the step (b) is carried out by directly adsorbing nucleic acids on the cationic surface of an electrode only once, or adsorbing alternately nucleic acid and cationic polymer onto the surface in the order of the nucleic acid, cationic polymer and nucleic acid by an alternate adsorption method.

7. The method according to claim 3 or claim 4, wherein the electrode is an electrode made of a metal selected from platinum, gold and aluminum.

8. The method according to claim 3 or claim 4, wherein the electrode substrate is a gold electrode substrate.

9. The method according to claim 8, wherein the gold electrode is a glass substrate or a transparent plastic substrate on which gold is deposited.

10. The method according to claim 5, wherein the transparent electrode is a glass or a transparent plastic substrate on which

indium-tin oxide, indium oxide, aluminum-doped zinc oxide or antimony-doped tin oxide is deposited.

11. The method according to claim 5, wherein the transparent electrode is a glass substrate or a transparent plastic substrate on which indium-tin oxide is deposited.

12. The method according to claim 3, wherein the thiol compound having an anionic functional group at its terminal is a thiol compound indicated by the formula (1):

$R^1(CH_2)_n$-SH (1)

(wherein R^1 represents an anionic functional group and n represents an integer of 1 to 40).

13. The method according to claim 12, wherein R^1 is a group selected from a carboxylic acid group, a phosphoric acid group, a sulfonic acid group and a phosphonic acid group.

14. The method according to claim 12, wherein the thiol compound represented by the formula (1) is a mercaptoalkanoic acid selected from 11-mercaptoundecanoic acid, 8-mercaptooctanoic acid and 15-mercaptohexadecanoic acid.

15. The method according to claim 3, 4 or 5, wherein the cationic polymer is a polymer selected from a polyethyleneimine, polyallylamine, polyvinylamine, polyvinylpyridine, aminoacetalized poly(vinyl alcohol), acrylic or methacrylic polymer having primary to quaternary amine at the terminal of the side chain, acid-treated gelatin, protamine, polylysine,

polyornithine, polyarginine, chitosan, DEAE-cellulose, DEAE-dextran and polyamidoamine dendrimer.

16. The method according to claim 4, wherein the thiol compound having a cationic functional group at the terminal is a thiol compound represented by the formula (2):

$R^2(CH_2)_n$-SH (2)

(wherein R^2 represents a cationic functional group and n represents an integer of 1 to 40).

17. The method according to claim 16, wherein R^2 is an amino group.

18. The method according to claim 1 or claim 2, wherein the nucleic acid is DNA, RNA, antisence nucleic acid, siRNA or expression vector thereof.

19. The method according to claim 1 or claim 2, wherein the nucleic acid is DNA or a part thereof which encodes a protein.

20. The method according to claim 1, wherein the step (B) is carried out by incubating cells on the nucleic acid-loaded electrode.

21. The method according to claim 2, wherein the step (c) is carried out by incubating cells on the surface of the nucleic acid-loaded electrode.

22. The method according to claim 1, wherein the step (C)

is carried out by providing a counter electrode facing to the nucleic acid-loaded electrode on which cells adhere and generating electric pulses between both electrodes.

23. The method according to claim 2, wherein the step (d) is carried out by providing a counter electrode facing to the nucleic acid-loaded electrode on which cells adhere and generating electric pulses between both electrodes.

24. The method according to claim 2, wherein an electrode with the cationic surface electrode is an electrode having a micropatterned surface.

25. An electrode with a cationic surface wherein the monolayer of a thiol compound, a disulfide compound or a sulfide compound having an anionic functional group at the terminal is formed and a cationic polymer is adsorbed onto the surface of the monolayer.

26. An electrode with a cationic surface wherein the monolayer of a thiol compound represented by the formula (1):

$$R^1(CH_2)_n\text{-}SH \quad (1)$$

(wherein R^1 represents an anionic functional group and n represents an integer of 1 to 40) is formed on the surface of a gold electrode substrate prepared by depositing gold onto a glass substrate and a cationic polymer is adsorbed onto the surface of the monolayer.